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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Application Number: 10/775,911
Filing Date: February 10, 2004
Appellant(s): MORGAN, DENNIS R.

Kevin M. Mason
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 09 September 2008 appealing from the Office action

mailed 01 May 2008.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings

which will directly affect or be directly affected by or have a bearing on the Board's decision in

the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in

the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is

substantially correct. The changes are as follows:

NEW GROUND(S) OF REJECTION

Claims 1, 7, 13, and 18 are additionally rejected under 35 U.S.C. 101.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

Madsen et al. "Optical filter architecture for approximating any 2 x 2 unitary matrix,"

Optics Letters, vol. 28, no. 17, April 1, 2003, pp. 534-536.

Eyal et al. "Design of Broad-Band PMD Compensation Filter," IEEE Photonics

Technology Letters, vol. 14, no. 8, August 2002, pp. 1088-1090.

Appellant's Admitted Prior Art (Appellant's originally-filed specification.

US 6,687,461 B1   MACFARLANE et al.   2-2004

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1-4 and 13-16 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Madsen et al. ("Optical filter architecture for approximating any 2 x 2 unitary

matrix," Optics Letters, vol. 28, no. 17, April 1, 2003, pages 534-536) in view of MacFarlane

et al. (US 6,687,461 B1).

Regarding **claim 1**, Madsen et al. disclose a method for compensating for polarization

mode dispersion in an optical fiber communication system (Figures 1-3), comprising the steps of:

reducing the polarization mode dispersion using a cascade of all-pass filters (see Abstract

and Figure 3); and

adjusting coefficients of the all-pass filters (see page 535, left column, first complete

paragraph).

Regarding **claim 13**, as similarly discussed above with regard to claim 1, Madsen et al.

disclose a polarization mode dispersion compensator in an optical fiber communication system,

comprising:

a cascade of all-pass filters having coefficients that are adjusted (again, see Abstract, Figure 3, and page 535, left column, first complete paragraph).

Regarding claims 1 and 13, Madsen et al. disclose adjusting the coefficients using a least squares algorithm (see page 535, left column, first complete paragraph) but do not specifically disclose adjusting the coefficients using a least mean square algorithm.

However, various optimization algorithms are well known in the signal processing and communication arts, and MacFarlane et al. in particular teach a system that is related to the one described by Madsen et al. including optical filters for compensating polarization mode dispersion having adjusted coefficients (column 1, lines 28-53; column 2, lines 51-65; column 5, lines 23-42). MacFarlane et al. specifically teach that the apparatus compensates signal irregularities "including chirp, polarization, and frequency dispersion" (column 1, lines 43-46). MacFarlane et al. further teach that the filter coefficients may be adjusted using a variety of minimization algorithms, including a least squares algorithm or a least mean square algorithm (column 19, lines 16-22).

Regarding claims 1 and 13, it would have been obvious to a person of ordinary skill in the art to specifically use a least mean square algorithm as taught by MacFarlane et al. in the system disclosed by Madsen et al. as an engineering design choice of another way to provide the minimization function already disclosed by Madsen et al. (Madsen et al., page 535, left column, first complete paragraph) and thereby effectively adjust the filter coefficients to quickly and accurately compensate dispersion. Both Madsen et al. and MacFarlane et al. teach various algorithms for performing a minimizing function, and it would have been obvious to a person of ordinary skill in the art to substitute one minimization algorithm for another to achieve a

predictable result of optimizing the filter coefficient values. Furthermore, MacFarlane et al.

particularly teach the substitution of least mean square algorithm for a least squares algorithm

(column 19, lines 16-22).

Regarding **claims 2 and 14**, Madsen et al. disclose that the cascade of all-pass filters

comprises a two-channel structure consisting of multiple cascades of all-pass filters and

directional couplers (Figure 3).

Regarding **claims 3 and 15**, Madsen et al. disclose that the coefficient values are adjusted

to minimize a cost function (page 535, left column, first complete paragraph). Examiner notes

that MacFarlane et al. also teach adjusting filter coefficients to minimize a cost function (column

19, lines 16-22).

Regarding **claims 4 and 16**, Madsen et al. disclose measuring the polarization mode

dispersion in a received optical signal (using the "estimate channel" element shown in Figure 1;

see also page 534, left column, second complete paragraph).

Claims 5 and 17 rejected under 35 U.S.C. 103(a) as being unpatentable over Madsen

et al. in view of MacFarlane et al. as applied to claims 4 and 16 respectively above, and

further in view of Appellant's Admitted Prior Art.

Regarding **claims 5 and 17**, Madsen et al. in view of MacFarlane et al. describe a system

and a method as discussed above with regard to claims 4 and 16 respectively, including a step of

measuring the polarization mode dispersion in a received optical signal. They do not specifically

suggest that the measuring step employs a tunable narrowband optical filter to render

information from energy detector measurements.

However, Appellant's Admitted Prior Art (Appellant's Figures 1-3) suggests a system that is related to the one described by Madsen et al. in view of MacFarlane et al., including a polarization mode dispersion compensator 110 and a channel estimate element 300 for measuring polarization mode dispersion in a received optical signal (Appellant's specification, page 3, lines 3-25). Appellant's Admitted Prior Art further suggests that the measuring step employs a tunable narrowband optical filter 304 to render information from energy detector measurements (see Appellant's Figure 3 and specification, page 3, lines 26-32 and page 4, lines 1-4).

Regarding claims 5 and 17, it would have been obvious to a person of ordinary skill in the art to include a tunable narrowband optical filter as taught by Appellant's Admitted Prior Art in the system described by Madsen et al. in view of MacFarlane et al. in order to effectively provide the polarization mode dispersion measurement already disclosed by Madsen et al. and thereby enable the filters to compensate for the dispersion accurately.

Claims 7-10 and 18-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Madsen et al. ("Optical filter architecture for approximating any 2 x 2 unitary matrix," Optics Letters, vol. 28, no. 17, April 1, 2003, pages 534-536) in view of Eyal. et al. ("Design of Broad-Band PMD Compensation Filters," IEEE Photonics Technology Letters, vol. 14, no. 8, August 2002, pages 1088-1090).

Regarding **claim 7**, Madsen et al. disclose a method for compensating for polarization mode dispersion in an optical fiber communication system (Figures 1-3), comprising the steps of:

reducing the polarization mode dispersion using a cascade of all-pass filters (see Abstract and Figure 3); and

adjusting coefficients of the all-pass filters (see page 535, left column, first complete paragraph).

Regarding **claim 18**, as similarly discussed above with regard to claim 7, Madsen et al. disclose a polarization mode dispersion compensator in an optical fiber communication system, comprising:

a cascade of all-pass filters having coefficients that are adjusted (again, see Abstract, Figure 3, and page 535, left column, first complete paragraph).

Regarding claims 7 and 18, Madsen et al. disclose adjusting the coefficients using a least squares algorithm (see page 535, left column, first complete paragraph) but do not specifically disclose adjusting the coefficients using a Newton algorithm.

However, various optimization algorithms are well known in the signal processing and communication arts, and Eyal. et al. in particular teach a system that is related to the one described by Madsen et al. including optical filters for compensating polarization mode dispersion having adjusted coefficients (page 1088). Eyal et al. further teach that the filter coefficients may be adjusted using a Newton algorithm (page 1089, see particularly the end of the first paragraph of the right column).

Regarding claims 7 and 18, it would have been obvious to a person of ordinary skill in the art to specifically use a Newton algorithm as taught by Eyal et al. in the system disclosed by Madsen et al. as an engineering design choice of another way to provide the minimization function already disclosed by Madsen et al. (Madsen et al., page 535, left column, first complete paragraph) and thereby effectively adjust the filter coefficients to quickly and accurately compensate dispersion. Both Madsen et al. and Eyal et al. teach various algorithms for

performing a minimizing function, and it would have been obvious to a person of ordinary skill in the art to substitute one minimization algorithm for another to achieve a predictable result of optimizing the filter coefficient values.

Regarding **claims 8 and 19**, Madsen et al. disclose that the cascade of all-pass filters comprises a two-channel structure consisting of multiple cascades of all-pass filters and directional couplers (Figure 3).

Regarding **claims 9 and 20**, Madsen et al. disclose that the coefficient values are adjusted to minimize a cost function (page 535, left column, first complete paragraph). Examiner notes that Eyal et al. also teach adjusting filter coefficients to minimize a cost function (page 1089).

Regarding **claims 10 and 21**, Madsen et al. disclose measuring the polarization mode dispersion in a received optical signal (using the "estimate channel" element shown in Figure 1; see also page 534, left column, second complete paragraph).

Claims 11 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Madsen et al. in view of Eyal et al. as applied to claims 7 and 18 respectively above, and further in view of Appellant's Admitted Prior Art.

Regarding **claims 11 and 22**, Madsen et al. in view of Eyal et al. describe a system and a method as discussed above with regard to claims 7 and 18 respectively, including a step of measuring the polarization mode dispersion in a received optical signal. They do not specifically suggest that the measuring step employs a tunable narrowband optical filter to render information from energy detector measurements.

However, Appellant's Admitted Prior Art (Appellant's Figures 1-3) suggests a system that is related to the one described by Madsen et al. in view of Eyal et al., including a

polarization mode dispersion compensator 110 and a channel estimate element 300 for

measuring polarization mode dispersion in a received optical signal (Appellant's specification,

page 3, lines 3-25). Appellant's Admitted Prior Art further suggests that the measuring step

employs a tunable narrowband optical filter 304 to render information from energy detector

measurements (see Appellant's Figure 3 and specification, page 3, lines 26-32 and page 4, lines

1-4).

Regarding claims 5 and 17, it would have been obvious to a person of ordinary skill in

the art to include a tunable narrowband optical filter as taught by Appellant's Admitted Prior Art

in the system described by Madsen et al. in view of Eyal et al. in order to effectively provide the

polarization mode dispersion measurement already disclosed by Madsen et al. and thereby

enable the filters to compensate for the dispersion accurately.

NEW GROUND(S) OF REJECTION

Claims 1-22 are rejected under 35 U.S.C. 101 because the claimed invention is

directed to non-statutory subject matter.

Regarding **claims 1-22**, although claims 1-12 appear to recite "a method for

compensating for polarization mode dispersion" and claims 13-22 appear to recite "a polarization

mode dispersion compensator," Appellant's specification on pages 13-14 states:

"The methods and apparatus discussed herein may be distributed as an article of

manufacture that itself comprises a computer readable medium having computer readable code

means embodied thereon. The computer readable program code means is operable, in

conjunction with a computer system, <u>to carry out all or some of the steps to perform the methods</u>

<u>or create the apparatuses discussed herein</u>. The computer readable medium may be a recordable

medium (e.g., floppy disks, hard drives, compact disks such as DVD, or memory cards) or may

be a transmission medium (e.g., a network comprising fiber-optics, the world-wide web, cables,

or a wireless channel using time-division multiple access, code-division multiple access, or other

radio-frequency channel). Any medium known or developed that can store information suitable

for use with a computer system may be used. The computer readable code means is any

mechanism for allowing a computer to read instructions and data, such as magnetic variations on

a magnetic media or height variations on the surface of a compact disk, such as a DVD."

Thus, reading claims 1-22 in light of the specification, the recited method or apparatus

encompasses software, per se. Software (i.e., functional descriptive material) per se **does not**

fall within any of the statutory categories, thus, is non-statutory subject matter (see

MPEP 2106, particularly 2106.01, "Computer-Related Nonstatutory Subject Matter").

(10) Response to Argument

Regarding Appellant's assertion on pages 3-8 of the Brief that MacFarlane et al. and Eyal

et al. do not teach all-pass filters, Examiner respectfully notes that the rejections above rely upon

Madsen et al. for a disclosure of all-pass filters in combination with additional teachings of

MacFarlane et al. or Eyal et al. with respect to a particular optimization algorithm. In response to

Appellant's arguments against the references individually, one cannot show nonobviousness by

attacking references individually where the rejections are based on combinations of references.

See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091,

231 USPQ 375 (Fed. Cir. 1986).

Regarding Appellant's assertion on page 4 of the Brief that MacFarlane et al. do not teach

polarization dispersion compensation, Examiner respectfully notes that MacFarlane et al.

specifically teach that their apparatus compensates signal irregularities "including chirp,

polarization, and frequency dispersion" (column 1, lines 43-46). Furthermore, Madsen et al.

already disclose adjusting all-pass filter coefficients, and MacFarlane et al. teach another

minimization/optimization algorithm that is also known in the art.

Regarding Appellant's assertion on pages 6-8 of the Brief that Eyal et al. do not teach the

adjustment of filter coefficients, Examiner respectfully notes that Eyal et al. teach using a

Newton algorithm to optimize variables in equations for producing optimized filter coefficients

and thereby teach "adjusting" coefficients using a Newton algorithm as recited in the claims.

Furthermore, Madsen et al. already disclose adjusting all-pass filter coefficients, and Eyal et al.

teach another minimization/optimization algorithm that is also known in the art.

In response to Appellant's argument that there is no suggestion to combine the

references, the examiner recognizes that obviousness can only be established by combining or

modifying the teachings of the prior art to produce the claimed invention where there is some

teaching, suggestion, or motivation to do so found either in the references themselves or in the

knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5

USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

In this case, Examiner respectfully maintains that Madsen et al, MacFarlane et al., and Eyal et al.

teach various algorithms for performing a minimizing function, and it would have been obvious

to a person of ordinary skill in the art to substitute one minimization algorithm for another in

optimizing the all-pass filters disclosed by Madsen et al. to achieve a predictable result of

optimizing the filter coefficient values. Regarding Appellant's assertions on pages 5 and 7 of the

Brief that "an all-pass filter is not advantageous," Examiner again respectfully notes that Madsen

et al. *explicitly disclose* all-pass filters as discussed above. Madsen et al. already disclose using a

least squares algorithm to optimize the all-pass filters, and MacFarlane et al. and Eyal et al. are

relied upon to provide teachings of other minimization/optimization algorithms that are also

known in the art.

Regarding Appellant's assertion on page 18 of the Brief that "the adaptation equations for

FIR filters do not apply to the adaptation of an all-pass filter," Examiner respectfully notes that

the claims rejected above do not specifically recite particular equations. In response to

Appellant's argument that the references fail to show certain features of Appellant's invention, it

is noted that the features upon which Appellant relies (i.e., particular equations) are not recited in

the rejected claim(s). Although the claims are interpreted in light of the specification, limitations

from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26

USPQ2d 1057 (Fed. Cir. 1993).

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related

Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

This examiner's answer contains a new ground of rejection set forth in section **(9)** above.

Accordingly, appellant must within **TWO MONTHS** from the date of this answer exercise one

of the following two options to avoid *sua sponte* **dismissal of the appeal** as to the claims subject

to the new ground of rejection:

(1) **Reopen prosecution.** Request that prosecution be reopened before the primary

examiner by filing a reply under 37 CFR 1.111 with or without amendment, affidavit or other

evidence. Any amendment, affidavit or other evidence must be relevant to the new grounds of

rejection. A request that complies with 37 CFR 41.39(b)(1) will be entered and considered. Any

request that prosecution be reopened will be treated as a request to withdraw the appeal.

(2) **Maintain appeal.** Request that the appeal be maintained by filing a reply brief as set

forth in 37 CFR 41.41. Such a reply brief must address each new ground of rejection as set forth

in 37 CFR 41.37(c)(1)(vii) and should be in compliance with the other requirements of 37 CFR

41.37(c). If a reply brief filed pursuant to 37 CFR 41.39(b)(2) is accompanied by any

amendment, affidavit or other evidence, it shall be treated as a request that prosecution be

reopened before the primary examiner under 37 CFR 41.39(b)(1).

Extensions of time under 37 CFR 1.136(a) are not applicable to the TWO MONTH time

period set forth above. See 37 CFR 1.136(b) for extensions of time to reply for patent

applications and 37 CFR 1.550(c) for extensions of time to reply for ex parte reexamination

proceedings.

Respectfully submitted,

/Christina Y. Leung/

Primary Examiner, Art Unit 2613

A Technology Center Director or designee must personally approve the new

ground(s) of rejection set forth in section (9) above by signing below:

/Mark Powell/

Director – TC 2600

Conferees:

/Jason Chan/

Supervisory Patent Examiner, Art Unit 2613

/Kenneth N Vanderpuye/

Supervisory Patent Examiner, Art Unit 2613